

## PATENT COOPERATION TREATY

PCT

## NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Commissioner  
US Department of Commerce  
United States Patent and Trademark  
Office, PCT  
2011 South Clark Place Room  
CP2/5C24  
Arlington, VA 22202  
ETATS-UNIS D'AMERIQUE  
in its capacity as elected Office

Date of mailing (day/month/year) 23 May 2001 (23.05.01)	
International application No. PCT/DK00/00501	Applicant's or agent's file reference 17.078
International filing date (day/month/year) 11 September 2000 (11.09.00)	Priority date (day/month/year) 10 September 1999 (10.09.99)
Applicant NIELSEN, Ulrich, Carlin	

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International Preliminary Examining Authority on:  
30 March 2001 (30.03.01)

☐ in a notice effecting later election filed with the International Bureau on:

2. The election ☒ was  
☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No.: (41-22) 740.14.35	Authorized officer Nestor Santesso Telephone No.: (41-22) 338.83.38
---	---

## PATENT COOPERATION TREATY

PCT

NOTIFICATION OF THE RECORDING  
OF A CHANGE(PCT Rule 92bis.1 and  
Administrative Instructions, Section 422)

From the INTERNATIONAL BUREAU

To:

PATENTGRUPPEN APS  
Arosgården  
Åboulevarden 31  
DK-8000 Århus C  
DANEMARK

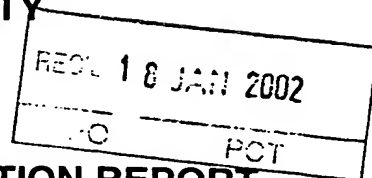
Date of mailing (day/month/year) 01 November 2001 (01.11.01)	<b>IMPORTANT NOTIFICATION</b>  International filing date (day/month/year) 11 September 2000 (11.09.00)
Applicant's or agent's file reference P 01 057 WO	
International application No. PCT/DK00/00501	

1. The following indications appeared on record concerning:	
<input type="checkbox"/> the applicant	<input type="checkbox"/> the inventor
<input checked="" type="checkbox"/> the agent	<input type="checkbox"/> the common representative
Name and Address K. SKØTT-JENSEN PATENTINGENIØRER A/S Lemmingvej 225 DK-8361 Hasselager Denmark	State of Nationality
	State of Residence
	Telephone No. +45 86 28 30 11
	Facsimile No. +45 86 28 12 40
Teleprinter No.	
2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:	
<input checked="" type="checkbox"/> the person	<input type="checkbox"/> the name
<input type="checkbox"/> the address	<input type="checkbox"/> the nationality
<input type="checkbox"/> the residence	
Name and Address PATENTGRUPPEN APS Arosgården Åboulevarden 31 DK-8000 Århus C Denmark	State of Nationality
	State of Residence
	Telephone No. 45 86 19 20 00
	Facsimile No. 45 86 19 91 91
Teleprinter No.	
3. Further observations, if necessary:	
4. A copy of this notification has been sent to:	
<input checked="" type="checkbox"/> the receiving Office	<input type="checkbox"/> the designated Offices concerned
<input type="checkbox"/> the International Searching Authority	<input checked="" type="checkbox"/> the elected Offices concerned
<input checked="" type="checkbox"/> the International Preliminary Examining Authority	<input type="checkbox"/> other:

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland  Facsimile No.: (41-22) 740.14.35	Authorized officer  Catherine MASSETTI  Telephone No.: (41-22) 338.83.38
---	--

PATENT COOPERATION TREATY

PCT



INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 17.078	<b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/DK00/00501	International filing date (day/month/year) 11/09/2000	Priority date (day/month/year) 10/09/1999
International Patent Classification (IPC) or national classification and IPC G01G13/00		
Applicant SCANVAEGT INTERNATIONAL A/S et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.



2. This REPORT consists of a total of 5 sheets, including this cover sheet.

☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 3 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☒ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand  30/03/2001	Date of completion of this report  16.01.2002
Name and mailing address of the international preliminary examining authority:   European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer  Stobbelaar, M  Telephone No. +49 89 2399 2827  

# INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/DK00/00501

## I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

**Description, pages:**

1-13 as originally filed

**Claims, No.:**

1-9 with telefax of 04/01/2002

**Drawings, sheets:**

1/2,2/2 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT**

International application No. PCT/DK00/00501

☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

*(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)*

6. Additional observations, if necessary:

**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. Statement

Novelty (N)	Yes: Claims 1-9
	No: Claims
Inventive step (IS)	Yes: Claims 1-9
	No: Claims
Industrial applicability (IA)	Yes: Claims 1-9
	No: Claims

2. Citations and explanations  
**see separate sheet**

**VII. Certain defects in the international application**

The following defects in the form or contents of the international application have been noted:  
**see separate sheet**

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/DK00/00501

**Re Item V**

**Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. Reference is made to the following documents:

- D1: WO 95 35238 A (SCANVAEGT AS ) 28 December 1995 (1995-12-28)
- D2: GB-A-2 167 211 (BRITISH CAST IRON RES ASS) 21 May 1986 (1986-05-21)
- D3: US-A-5 501 571 (W VAN DURRETT ET AL) 26 March 1996 (1996-03-26)
- D4: EP-A-0 706 838 (SPELLENC SA ) 17 April 1996 (1996-04-17)
- D5: WO 98 19799 A (NAT RECOVERY TECH INC) 14 May 1998 (1998-05-14)
- D6: PATENT ABSTRACTS OF JAPAN vol. 18, no. 243 (M-1602), 10 May 1994 (1994-05-10) & JP 60 31667 A (HITACHI LTD), 8 February 1985 (1985-02-08)

2. The invention relates to batching of supplied items in weight-determined groups. Closest prior art is formed by D1, which discloses a system for forming weighed batches of foodstuff articles. In D1 (see p.8, lines 18-31 and Fig.4) a row of robot units 50 is provided, each robot unit being able to select a supplied item and to deliver it to one corresponding carrier plate 48.

The invention according to independent claims 1 and 6 is characterized in that robots are used, which are able to deliver a selected item to different depositing positions, depending on the weight of the selected item and the weight already present in the different positions. With such more movable robots a more effective, compact transport system is obtained, compared with D1.

The other documents D2 - D6 cited in the International Search Report do not relate to batching in weight-determined groups. That means, that the robots used in D2 - D6 do not select and deposit an item depending on the weight and the weight already present in different positions. Consequently a combination of D1 with one of the documents D2 - D6 would not lead in an evident way to the method/system according to the claims 1 and 6.

In more detail: Document D2 discloses (see column 3, lines 91-100) a system with

a robot for picking up articles and to carry the articles away for further treatment, according to the class of the article. Document D3 (see abstract) discloses an automated palletizing system with a robot for picking up delivered objects and placing them on a pallet. No selective gripping and transferring is performed. Document D4 uses (see col.6, line 9 - col.7, line 28) a robot for selecting and transporting items according to their material, however without making batches in weight-determined groups. D5 relates to a system for sorting out items by means of vision equipment. Weighing means are not involved and the system is not related to batching in weight-determined groups. D6 relates to a system for sorting of manufactured items in consideration of manufacturing tolerances.

Therefore the subject-matter of independent claims 1 and 6 meets the requirements of articles 33 (2) and 33 (3) PCT.

2. Claims 2-5 and 7-9 are dependent on claims 1 or 6 and as such also meet the requirements of the PCT with respect to novelty and inventive step.

### **Re Item VII**

#### **Certain defects in the international application**

1. Contrary to the requirements of Rule 5.1(a)(ii) PCT, the relevant background art disclosed in the documents D1 - D6 is not mentioned in the description, nor are these documents identified therein.
2. The features of the claims are not provided with reference signs placed in parentheses (Rule 6.2(b) PCT).

PC

## REQUEST

The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty.

For Receiving Office use only

International Application No. PCT/DK 00/00501

11 SEPTEMBER 2000

International Filing Date

Danish Patent and  
Trademark Office

Name of receiving Office and "PCT International Application"

Applicant's or agent's file reference  
(if desired) (12 characters maximum) 17.078

## Box No. I TITLE OF INVENTION

A grader apparatus

## Box No. II APPLICANT

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

Scanvægt International A/S  
P.O. Pedersens Vej 18  
DK-8200 Århus N  
Denmark

☐ This person is also inventor.

Telephone No.

Facsimile No.

Teleprinter No.

State (that is, country) of nationality:  
DenmarkState (that is, country) of residence:  
DenmarkThis person is applicant  
for the purposes of:☐ all designated  
States☒ all designated States except  
the United States of America☐ the United States  
of America only☐ the States indicated in  
the Supplemental Box

## Box No. III FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

NIELSEN, Ulrich Carlin  
Hjarbæksvej 20  
DK-8680 Ry  
Denmark

This person is:

☐ applicant only☒ applicant and inventor☐ inventor only (If this check-box  
is marked, do not fill in below.)State (that is, country) of nationality:  
DenmarkState (that is, country) of residence:  
DenmarkThis person is applicant  
for the purposes of:☐ all designated  
States☐ all designated States except  
the United States of America☒ the United States  
of America only☐ the States indicated in  
the Supplemental Box☐ Further applicants and/or (further) inventors are indicated on a continuation sheet.

## Box No. IV AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCE

The person identified below is hereby/has been appointed to act on behalf  
of the applicant(s) before the competent International Authorities as:

☒ agent☐ common representative

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)

K. Skøtt-Jensen Patentingeniører A/S  
Lemmingvej 225  
DK-8361 Hasselager  
Denmark

Telephone No.

+45 86 28 30 11

Facsimile No.

+45 86 28 12 40

Teleprinter No.

68729 (jypat dk)

☐ Address for correspondence: Mark this check-box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special address to which correspondence should be sent.

CONFIRMATION COPY



## Box No.V DESIGNATION OF STATES

The following designations are hereby made under Rule 4.9(a) (mark the applicable check-boxes; at least one must be marked):

## Regional Patent

- ☒ AP ARIPO Patent: GH Ghana, GM Gambia, KE Kenya, LS Lesotho, MW Malawi, MZ Mozambique, SD Sudan, SL Sierra Leone, SZ Swaziland, TZ United Republic of Tanzania, UG Uganda, ZW Zimbabwe, and any other State which is a Contracting State of the Harare Protocol and of the PCT
- ☒ EA Eurasian Patent: AM Armenia, AZ Azerbaijan, BY Belarus, KG Kyrgyzstan, KZ Kazakhstan, MD Republic of Moldova, RU Russian Federation, TJ Tajikistan, TM Turkmenistan, and any other State which is a Contracting State of the Eurasian Patent Convention and of the PCT
- ☒ EP European Patent: AT Austria, BE Belgium, CH and LI Switzerland and Liechtenstein, CY Cyprus, DE Germany, DK Denmark, ES Spain, FI Finland, FR France, GB United Kingdom, GR Greece, IE Ireland, IT Italy, LU Luxembourg, MC Monaco, NL Netherlands, PT Portugal, SE Sweden, and any other State which is a Contracting State of the European Patent Convention and of the PCT
- ☒ OA OAPI Patent: BF Burkina Faso, BJ Benin, CF Central African Republic, CG Congo, CI Côte d'Ivoire, CM Cameroon, GA Gabon, GN Guinea, GW Guinea-Bissau, ML Mali, MR Mauritania, NE Niger, SN Senegal, TD Chad, TG Togo, and any other State which is a member State of OAPI and a Contracting State of the PCT (if other kind of protection or treatment desired, specify on dotted line) .....

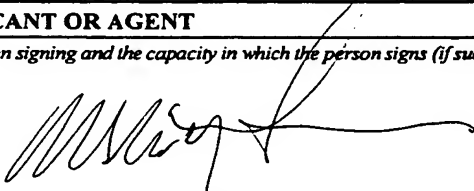
## National Patent (if other kind of protection or treatment desired, specify on dotted line):

- |  |  |
|--|--|
| <input checked="" type="checkbox"/> AE United Arab Emirates                  | <input checked="" type="checkbox"/> LC Saint Lucia                               |
| <input checked="" type="checkbox"/> AG Antigua and Barbuda                   | <input checked="" type="checkbox"/> LK Sri Lanka                                 |
| <input checked="" type="checkbox"/> AL Albania                               | <input checked="" type="checkbox"/> LR Liberia                                   |
| <input checked="" type="checkbox"/> AM Armenia                               | <input checked="" type="checkbox"/> LS Lesotho                                   |
| <input checked="" type="checkbox"/> AT Austria Patent and Utility Model      | <input checked="" type="checkbox"/> LT Lithuania                                 |
| <input checked="" type="checkbox"/> AU Australia                             | <input checked="" type="checkbox"/> LU Luxembourg                                |
| <input checked="" type="checkbox"/> AZ Azerbaijan                            | <input checked="" type="checkbox"/> LV Latvia                                    |
| <input checked="" type="checkbox"/> BA Bosnia and Herzegovina                | <input checked="" type="checkbox"/> MA Morocco                                   |
| <input checked="" type="checkbox"/> BB Barbados                              | <input checked="" type="checkbox"/> MD Republic of Moldova                       |
| <input checked="" type="checkbox"/> BG Bulgaria                              | <input checked="" type="checkbox"/> MG Madagascar                                |
| <input checked="" type="checkbox"/> BR Brazil                                | <input checked="" type="checkbox"/> MK The former Yugoslav Republic of Macedonia |
| <input checked="" type="checkbox"/> BY Belarus                               | <input checked="" type="checkbox"/> MN Mongolia                                  |
| <input checked="" type="checkbox"/> BZ Belize                                | <input checked="" type="checkbox"/> MW Malawi                                    |
| <input checked="" type="checkbox"/> CA Canada                                | <input checked="" type="checkbox"/> MX Mexico                                    |
| <input checked="" type="checkbox"/> CH and LI Switzerland and Liechtenstein  | <input checked="" type="checkbox"/> MZ Mozambique                                |
| <input checked="" type="checkbox"/> CN China                                 | <input checked="" type="checkbox"/> NO Norway                                    |
| <input checked="" type="checkbox"/> CR Costa Rica                            | <input checked="" type="checkbox"/> NZ New Zealand                               |
| <input checked="" type="checkbox"/> CU Cuba                                  | <input checked="" type="checkbox"/> PL Poland                                    |
| <input checked="" type="checkbox"/> CZ Czech Republic Patent and Util. Mod.  | <input checked="" type="checkbox"/> PT Portugal                                  |
| <input checked="" type="checkbox"/> DE Germany Patent and Util. Mod.         | <input checked="" type="checkbox"/> RO Romania                                   |
| <input checked="" type="checkbox"/> DK Denmark Patent and Util. Mod.         | <input checked="" type="checkbox"/> RU Russian Federation                        |
| <input checked="" type="checkbox"/> DM Dominica                              | <input checked="" type="checkbox"/> SD Sudan                                     |
| <input checked="" type="checkbox"/> DZ Algeria                               | <input checked="" type="checkbox"/> SE Sweden                                    |
| <input checked="" type="checkbox"/> EE Estonia Patent and Util. Mod.         | <input checked="" type="checkbox"/> SG Singapore                                 |
| <input checked="" type="checkbox"/> ES Spain                                 | <input checked="" type="checkbox"/> SI Slovenia                                  |
| <input checked="" type="checkbox"/> FI Finland Patent and Util. Mod.         | <input checked="" type="checkbox"/> SK Slovakia Patent and Util. Mod.            |
| <input checked="" type="checkbox"/> GB United Kingdom                        | <input checked="" type="checkbox"/> SL Sierra Leone                              |
| <input checked="" type="checkbox"/> GD Grenada                               | <input checked="" type="checkbox"/> TJ Tajikistan                                |
| <input checked="" type="checkbox"/> GE Georgia                               | <input checked="" type="checkbox"/> TM Turkmenistan                              |
| <input checked="" type="checkbox"/> GH Ghana                                 | <input checked="" type="checkbox"/> TR Turkey                                    |
| <input checked="" type="checkbox"/> GM Gambia                                | <input checked="" type="checkbox"/> TT Trinidad and Tobago                       |
| <input checked="" type="checkbox"/> HR Croatia                               | <input checked="" type="checkbox"/> TZ United Republic of Tanzania               |
| <input checked="" type="checkbox"/> HU Hungary                               | <input checked="" type="checkbox"/> UA Ukraine                                   |
| <input checked="" type="checkbox"/> ID Indonesia                             | <input checked="" type="checkbox"/> UG Uganda                                    |
| <input checked="" type="checkbox"/> IL Israel                                | <input checked="" type="checkbox"/> US United States of America                  |
| <input checked="" type="checkbox"/> IN India                                 | <input checked="" type="checkbox"/> UZ Uzbekistan                                |
| <input checked="" type="checkbox"/> IS Iceland                               | <input checked="" type="checkbox"/> VN Viet Nam                                  |
| <input checked="" type="checkbox"/> JP Japan                                 | <input checked="" type="checkbox"/> YU Yugoslavia                                |
| <input checked="" type="checkbox"/> KE Kenya                                 | <input checked="" type="checkbox"/> ZA South Africa                              |
| <input checked="" type="checkbox"/> KG Kyrgyzstan                            | <input checked="" type="checkbox"/> ZW Zimbabwe                                  |
| <input checked="" type="checkbox"/> KP Democratic People's Republic of Korea |  |
| <input checked="" type="checkbox"/> KR Republic of Korea                     |  |
| <input checked="" type="checkbox"/> KZ Kazakhstan                            |  |

Check-box reserved for designating States which have become party to the PCT after issuance of this sheet:

☐ .....

**Precautionary Designation Statement:** In addition to the designations made above, the applicant also makes under Rule 4.9(b) all other designations which would be permitted under the PCT except any designation(s) indicated in the Supplemental Box as being excluded from the scope of this statement. The applicant declares that those additional designations are subject to confirmation and that any designation which is not confirmed before the expiration of 15 months from the priority date is to be regarded as withdrawn by the applicant at the expiration of that time limit. (Confirmation (including fees) must reach the receiving Office within the 15-month time limit.)

<b>Box No. VI PRIORITY CLAIM</b>					<input type="checkbox"/> Further priority claim is indicated in the Supplemental Box.				
Filing date of earlier application (day/month/year)		Number of earlier application	Where earlier application is:						
			national application: country	regional application:* regional Office	international application: receiving Office				
item (1) 10 September 1999 10.09.1999		PA 1999 01281	Denmark						
item (2)									
item (3)									
<input checked="" type="checkbox"/> The receiving Office is requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) (only if the earlier application was filed with the Office which for the purposes of the present international application is the receiving Office) identified above as item(s): <b>PA 1999 01281</b>									
<small>* Where the earlier application is an ARIPO application, it is mandatory to indicate in the Supplemental Box at least one country party to the Paris Convention for the Protection of Industrial Property for which that earlier application was filed (Rule 4.10(b)(ii)). See Supplemental Box.</small>									
<b>Box No. VII INTERNATIONAL SEARCHING AUTHORITY</b>									
<b>Choice of International Searching Authority (ISA)</b> (if two or more International Searching Authorities are competent to carry out the international search, indicate the Authority chosen; the two-letter code may be used): <b>ISA/EP</b>			<b>Request to use results of earlier search; reference to that search (if an earlier search has been carried out by or requested from the International Searching Authority):</b> Date (day/month/year)                      Number                      Country (or regional Office)						
<b>Box No. VIII CHECK LIST; LANGUAGE OF FILING</b>									
This international application contains the following number of sheets: request : 3 description (excluding sequence listing part) : 10 claims : 2 abstract : drawings : 2 sequence listing part of description : Total number of sheets : 17			This international application is accompanied by the item(s) marked below: 1. <input checked="" type="checkbox"/> fee calculation sheet 2. <input type="checkbox"/> separate signed power of attorney 3. <input type="checkbox"/> copy of general power of attorney; reference number, if any: 4. <input type="checkbox"/> statement explaining lack of signature 5. <input type="checkbox"/> priority document(s) identified in Box No. VI as item(s): 6. <input type="checkbox"/> translation of international application into (language): 7. <input type="checkbox"/> separate indications concerning deposited microorganism or other biological material 8. <input type="checkbox"/> nucleotide and/or amino acid sequence listing in computer readable form 9. <input type="checkbox"/> other (specify):						
Figure of the drawings which should accompany the abstract:			Language of filing of the international application: <b>Danish</b>						
<b>Box No. IX SIGNATURE OF APPLICANT OR AGENT</b>									
Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the request).									
 <b>K. Skøtt-Jensen</b>									

For receiving Office use only			
1. Date of actual receipt of the purported international application: <b>11 SEP 2000</b> (11.09.2000)		2. Drawings: <input type="checkbox"/> received:  <input type="checkbox"/> not received:	
3. Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application:			
4. Date of timely receipt of the required corrections under PCT Article 11(2):			
5. International Searching Authority (if two or more are competent): <b>ISA/ EPO</b>		6. <input type="checkbox"/> Transmittal of search copy delayed until search fee is paid.	

For International Bureau use only	
Date of receipt of the record copy by the International Bureau: <b>28 SEPTEMBER 2000</b>	<b>( 28.09.00 )</b>

1/2

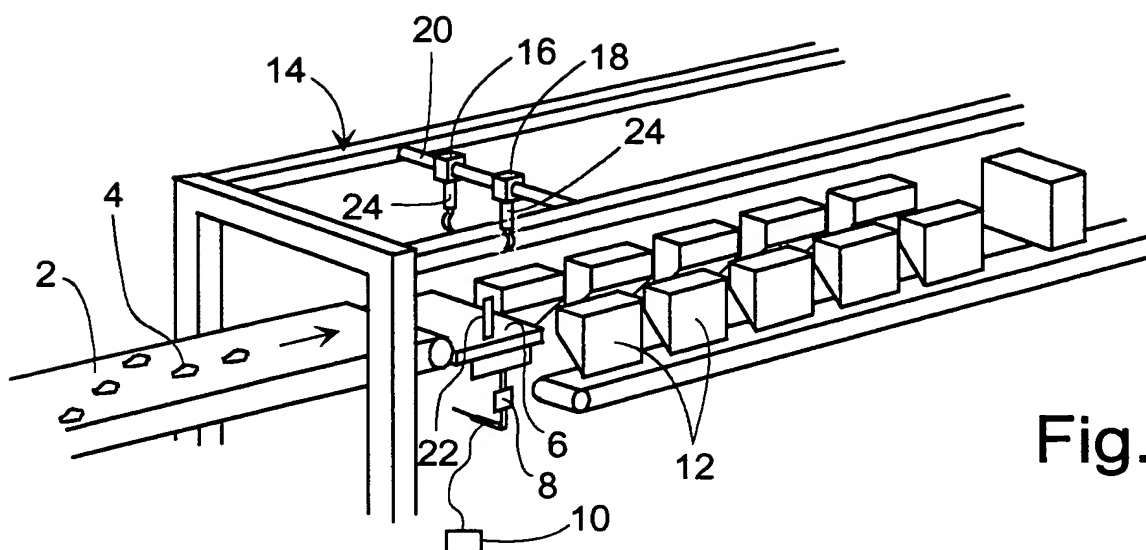


Fig.1

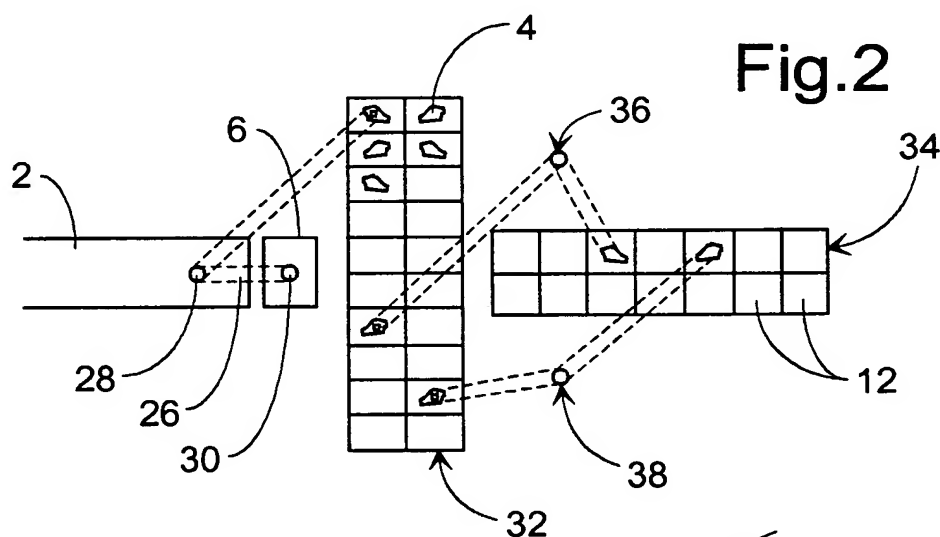


Fig.2

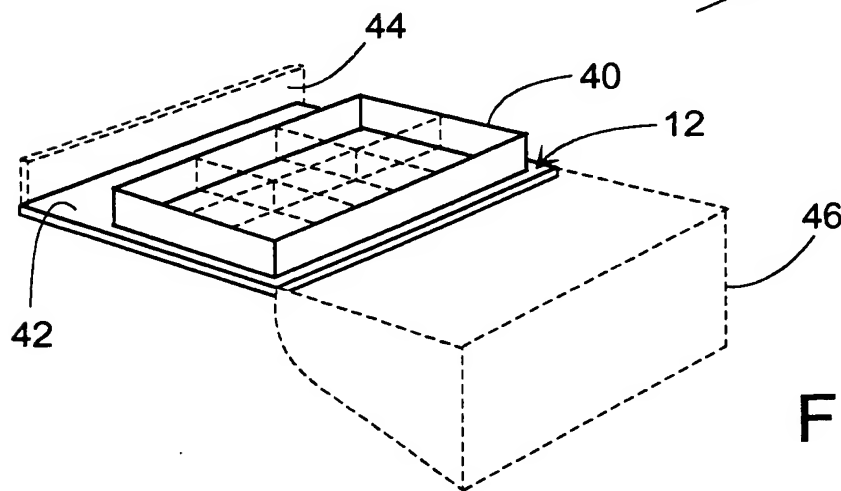


Fig.3

2/2

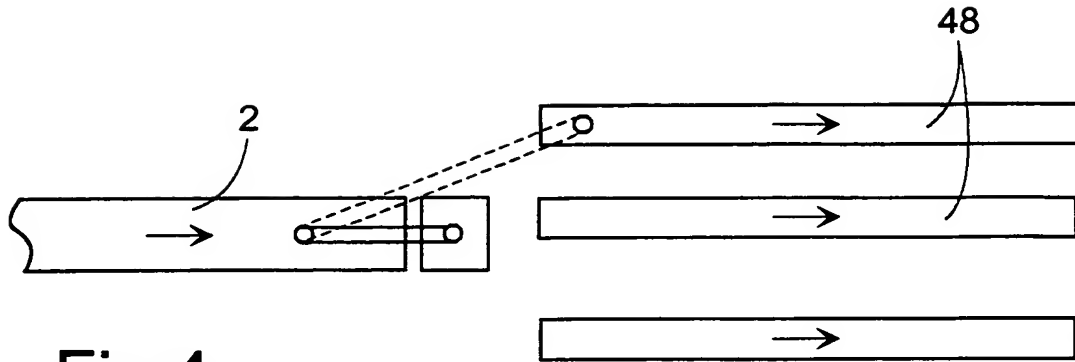


Fig.4

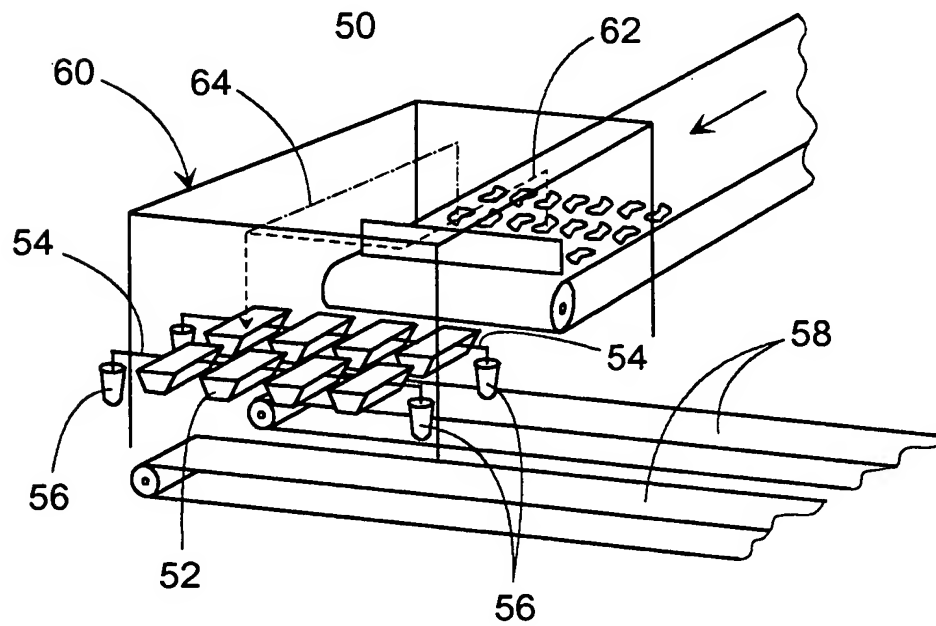


Fig.5

## A grader apparatus

Den foreliggende opfindelse angår veje- og portionerings-  
teknik, med basis i den såkaldte graderteknik, hvor en række  
5 af emner, som skal udportioneres, navnlig naturlige fødevarer-  
emner med svingende vægt, underkastes en indvejning for der-  
efter på computerstyret måde at blive selektivt sammenført i  
modtagestationer for opbygning af vægtbestemte portioner i  
disse stationer. Efter kendt praksis sker dette ved en ind-  
10 vejning på en dynamisk vægt og en efterfølgende transport  
langs en udsorteringsbane med selektivt aktiverbare udsty-  
ringsmidler for tilbringning af emnerne til de respektive  
modtagestationer langs denne bane.

Det er ved opfindelsen indset, at der med meget attrakti-  
15 ve konsekvenser kan benyttes en radikalt ændret teknik til  
løsning af både den pågældende opgave og forskellige beslæg-  
tede opgaver, nemlig ved at udføre ikke blot tilbringningen,  
men fortrinsvis også indvejningen under anvendelse af den ef-  
terhånden højt og kommercielt udviklede robotteknik.

20 Især ved brug af et visionsudstyr er det en let opgave  
for en robotarm at gribe et tilført emne i et tilbringnings-  
område, f.eks. med en sugekop og at føre emnet til enhver  
modtagestation indenfor robotarmens operationsområde. Dette  
kan gøres umiddelbart, hvis emnet allerede er blevet vejnet og  
25 positionsbestemt med hensyn til modtagestation, og disse sta-  
tioner behøver så ikke at være fysisk beliggende i noget be-  
stemt mønster såsom langs med et transportbånd, uanset at en  
vis rækkebeliggenhed kan være praktisk af hensyn til udluk-  
ningen og fraføringen af de dannede portioner.

30 Det er dog et vigtigt aspekt ved opfindelsen, at robotar-  
men i sig selv kan være indrettet til ikke alene at gribe,  
men også at vægtbestemme et tilført og grebet emne allerede  
under en indledende løftning af emnet fra dets underlag. Det-  
te kan gøres på en direkte måde ved at robotarmens gribeværk-  
35 tøj er monteret i forbindelse med en vejecelle og fortrinsvis  
også et accelerometer, således at en vejning kan udføres un-  
der en ujævn bevægelse, helst ved en indledende lodret løft-  
ning, således at vægtbestemmelsen og allokeringen af emnet

CONFIRMATION COPY

kan være udført når emnet er løftet til en højde, hvorfra der indledes en udbringning af emnet i retning mod den udvalgte modtagestation, herunder en udsvingning for udførelse af en bevægelse langs med en eller flere f.eks. rundtgående rækker af modtagestationer. Vægtbestemmelsen kan også ske mere indirekte, f.eks. ved brug af et visionssystem, som i forbindelse med løftningen af emnet nu også får adgang til en detektering af emnets underside, hvorved vægten kan bestemmes med en nøjagtighed, som kan være tilstrækkelig i mange sammenhænge. En indirekte vægtbestemmelse kan også udføres ved, at robotarmen påvirkes med et nøje kontrolleret løftemoment, som vil modvirkes af emnets inertie, hvorved der ved en momentanalyse af løfteforløbet kan beregnes et udtryk for emnevægten.

Ved anvendelsen af et visionsudstyr til stedbestemmelse af ankomende emner i forbindelse med den robotbaserede vægtbestemmelse af de grebne emner fremstår der en markant ændring af de hidtil gældende betingelser for funktionen af gradermaskinerne. Denne funktion har hidtil været betinget af, at de ankomende emner tilføres enkeltvis til den dynamiske vejestation og derefter videreføres enkeltvis, dvs. med passende indbyrdes afstand, langs udsorteringsbanen, hvilket herefter ikke vil være aktuelt. Visionsudstyret kan overskue et forholdsvis langt og bredt tilførelsesområde, på hvilket emnerne kan fremkomme både ved siden af hverandre og uden nogen kritisk adskillelse i hverken bredde- eller længderetningen, idet robotarmen alligevel med stor præcision kan slå ned på ethvert udvalgt emne. Det vil være en yderligere mulighed, at der ved hjælp af visionsudstyret kan overskues indtil flere kandidatemner til et efterlyst emne af en bestemt nøjagtig vægt, f.eks. for afslutning af en portionsopbygning til fast vægt. Hvis visionsudstyret i sig selv ikke er i stand til at lave en vægtbestemmelse med fornøden nøjagtighed, så vil det dog kunne "vægtklassebestemme" emnerne og altså herved angive f.eks. 2-4 emner, der med god sandsynlighed kan være så nær den efterlyste vægt, at i hvert fald et af emnerne vil kunne bruges til formålet. Der kan så udføres en mere nøjagtig vægtbestemmelse ved at den operative robot laver en kontrol-

vejning af disse udvalgte emner og derved enten udvælger den bedste kandidat eller undlader at bruge nogen af dem.

Hertil kommer, at man ved brugen af visionsudstyret yderligere kan typebestemme emner, der tilføres i blandet type-formation, f.eks. i form af forskellige stykker af parterede kyllinger. Dette vil i visse produktioner være et ganske vigtigt kriterium for allokeringen af emnerne.

Det skal dog understreges, at det ikke vil være nogen betingelse, at der benyttes et visionudstyr, idet det er fundet muligt at lade en robotgriber hente emner fra et område med sammenstuede emner. Eventuelt kan griberen være indrettet med en sensor til registrering af, at det ikke er lykkedes at gribe noget emne, hvorefter den med det samme kan flyttes lidt for et nyt forsøg.

Ved håndtering af emner såsom hele fisk eller kyllingebein ("drumsticks"), der i hver af modtagestationerne ønskes modtaget med således modsatrettede orienteringer, at de kan sammenlægges i tæt formation, henholdsvis at de i en modtagekasse kan portionsopbygges i flere lag for opnåelse af en nogenlunde vandret overside af kassefyldningen, vil styreenheden let kunne instrueres om at påvirke robotarmens gribeværktøj til, om fornødent, at dreje det grebne emne gennem en sådan vinkel, som vil være passende for sikring af, at emnet ved aflevering til modtagestationen vil have en orientering, som tilgodeser det pågældende krav ud fra de informationer, som allerede findes i styrecomputeren.

Herudover vil det ved opfindelsen være en mulighed, at "systemet", dvs. styringen af robotarmen, er programmeret til fra tid til anden og f.eks. især efter hver arbejdsdag, at styre robotarmens griber til gribning af en rensedyse eller slange, ved hvis hjælp apparatet så derefter kan rense sig selv og alle modtagestationerne. Slutteligt kan selve griberen renses ved samvirke med en stationær rensedyse.

Der er hidtil betragtet en vægtbestemt udportionering, men teknikken vil have yderligere muligheder såsom en ren ud-sortering af emner efter snart sagt ethvert kriterium, som ikke nødvendigvis skal indbefatte et vægtekriterium, f.eks. efter type, farve, form, grad af eventuel misdannelse, etc.

Teknikken kan yderligere benyttes til udfordeling af emner til en gruppe af modtagestationer, hvori de modtagne emner vejes separat med henblik på at blive sammenført i vægtbestemte portioner på basis af det såkaldte kombinationsvægtprincip.

Ved udlægning af emner på et emballageelement såsom lakseskiver på en papplade eller ved udlægning af emner i sortimentsæsker vil det være en mulighed, at der er blevet udlagt et emne, som viser sig at kunne erstattes af et bedre egnet emne, og der vil her være den særlige mulighed, både at emnerne kan placeres i særlige mønstre, f.eks. ved skæloplægning eller ved siden af hinanden, og at robotten kan dirigeres af styreenheden til at fjerne det "skæve" emne fra underlaget til fordel for en udlægning af det endnu bedre emne.

Det er nævnt, at der i tilgangsområdet til robotten kan forekomme et forholdsvis stort antal af emner, der kan gribes selektivt, eventuelt endda af mere end en enkelt robot. Det kan forekomme, at der herved kan registreres et underskud af emner af en eller flere forskellige kvaliteter, f.eks. type eller størrelse, som afventes for fremme af en hurtig udportionering. Det er her en yderligere mulighed, at der kan arbejdes med et forankoblet tilgangsområde, eventuelt endda af forøget størrelse, hvor en eller flere robotter på tilsvarende måde arbejder for selektivt at overføre relevante emner til det operative tilgangsområde.

Hvis den operative robotarm griber et emne, som efter vægtbestemmelsen ikke er velegnet til anbringelse i nogen af modtagestationerne, kan den aflevere emnet enten til en recirkuleringsstation eller blot tilbage til tilgangsområdet, henholdsvis til et særligt parkeringsområde for allerede vægtbestemte emner, der så er klar til selektiv afhentning ved først givne lejlighed under det videre forløb.

Et sådant "parkeringsområde" kan også udnyttes operativt ved at en eller et flertal af robotter beskæftiges med at modtage de tilførte emner og udføre vægtbestemmelsen af dem for derefter at aflevere emnerne i et parkeringsområde under registrering af de respektive positioner og vægte. Operationsrobotten vil herefter alene have til opgave at udfordele



emnerne til modtagestationerne, dvs. den kan være uden vejemidler og uden visionsudstyr, og den kan arbejde med forøget hastighed i og med at vejefunktionen bortfalder. I parkeringsområdet kan emnerne placeres tæt ved siden af hinanden, 5  
dvs. der kan opereres med et ganske stort antal af kandidater til udportionering.

Det kan være ret krævende at arrangere en relevant vejindretning i forbindelse med en robotarm, når der skal arbejdes med de ønskværdige, relativt hurtige operationsfrekvenser. Det er allerede nævnt, at vejningerne udmærket kan ske 10  
ved en mellemaflevering af emnerne til en statisk vægt, men dette vil uundgåeligt medføre en forlængelse af cyklustiden, da der ved enhver vejning vil forekomme dels en indsvingningsperiode og dels en vejeperiode, og når ingen af disse 15  
kan integreres med en operativ bevægelse af emner, så vil begge perioderne, uanset at de kan være af kort varighed, virke forsinkende på en hurtigt emnehåndtering. På denne baggrund er det et særligt træk ved opfindelsen, at der ifølge denne kan arbejdes med "negativvejning", nemlig ved at nytillførte emner kan tilvejebringes successivt til en statisk vægt 20  
eller buffervægt, der registrerer vægten af det eller de emner, der er tilbragt til vægten, idet vægtbestemmelsen af et emne, som så gribes og fjernes af robotarmen, derved kan registreres ved den tilhørende detekterede vægtformindskelse på vægten. Det nævnte indsvingnings- og vejeforløb kan herved 25  
være overstået allerede inden det relevante emne gribes og fjernes, og selvom der så efterfølgende må accepteres en fornyet indsvingnings- og vejningsperiode for bestemmelse af vægten af det forsvundne emne, så kan dette dog ske under 30  
selve initialbevægelsen af det grebne emne og altså alligevel integreret med denne bevægelse uden forsinkelse af denne.

Det er i det foregående antydnet, at "robotarmen" bevæger sig i en omdrejende bevægelse, uanset om robotten i øvrigt eller tillige bevæger sig i diverse vandrette retninger, og 35  
det skal her blot understreges, at opfindelsen ikke vil være tilsvarende begrænset, da robotarmen med dens tilhørende gribeorgan ligeså godt kan deplaceres som en fast arm på en robotstruktur, der som en integreret helhed bevæges på styret,

koordinatrelateret måde i et længde/bredde-kontrolleret føringssystem.

I det følgende vil opfindelsen blive nærmere beskrevet netop med basis i et sådant koordinatrelateret system, uden  
5 at dette skal udelukke et drejende system, og i øvrigt med henvisning til tegningen, på hvilken

fig. 1 er et skematisk perspektivbillede af et udsorterings- eller -portioneringsapparat ifølge opfindelsen,

fig. 2 et skematisk ovenbillede af et modificeret anlæg  
10 ifølge opfindelsen,

fig. 3 et perspektivbillede af en modtagestation deri,

fig. 4 et ovenbillede af et andet modificeret anlæg, og

fig. 5 et skematisk perspektivbillede af et tredje modificeret anlæg.

15

I fig. 1 er vist en tilbringningstransportør 2, som tilbringer relevante emner 4 til en vejeglade 6 hørende til en vejestation, som er repræsenteret ved en underliggende vejecelle 8, og som er forbundet med en registrerings- og en styrecomputer 10. Transportbanen 2 fortsætter derefter i en  
20 dobbeltrække af modtagebeholdere eller -stationer 12, som er vist anbragt i direkte forlængelse af transportøren 2, men som ligeså godt kunne indtage enhver anden retning, f.eks. vinkelret derpå.

25

Oven over vejegladen 6 er arrangeret et koordinatstyret føringssystem 14 for en emnegriberenhed 16 bestående af en basisdel 18, som ved egnede drivmidler er tværforskydelig som en slæde på en i strukturen 14 længdeforskydelig tværstang 20, og som desuden har en nedragende arm 22 med et nedre gribeorgan 24, som kan ned- og opføres og aktiveres til gribe-  
30 ning/slipning af emner 4.

Gribeorganet 24 kunne ligeså godt være anbragt på en svingarm i et polært dirigeret føringssystem, hvorved rækken af modtagestationer 12 naturligt kunne forløbe med en udpræget krumning.  
35

Når et emne 4 er blevet afleveret til vejegladen 6 kan det hurtigt derefter blive grebet af gribeorganet 24 og derefter blive videreført for afgivelse til enhver af modtage-

stationerne 12, baseret på de allokeringsbeslutninger, som jfr. konventionel graderteknik træffes af styrecomputeren 10.

Allerede herved vil være overkommet en del af de fremfø-  
ringsproblemer, som optræder ved den kendte graderteknik,  
5 nemlig specielt med hensyn til klæbende eller let rullelige  
emner, som kan være vanskelige at udfordele når dette skal  
ske ved sidevårts udstyring fra en fremførende transportør.  
Eventuelt kan vejepladen 6 eller et forudgående afsnit af fø-  
detransportøren 2 være forsynet med en fremefter tilspidsen-  
10 de, opstående V-formet ribbestruktur 22, som vil fastlægge en  
veldefineret afleveringsposition for emnerne 4, således at  
emnerne med god sikkerhed kan gribes og videreføres af gribe-  
ren 24. Ved afleveringen af emnerne til modtagestationerne 12  
vil der ikke optræde nogen væsentlig usikkerhed i og med at  
15 det her blot drejer sig om en nogenlunde nøjagtig frigivelse  
af de grebne emner 4 fra det overliggende gribeorgan 24.

Det vil dog i forbindelse med opfindelsen være en fordel-  
agtig mulighed, at der benyttes et detektorsystem såsom et  
visionkamera, der kan detektere enhver ikke-central beliggen-  
20 hed af emner 4 på tilførselsbåndet 2 og således også være be-  
stemmende for, at relevante emner skal gribes i mere eller  
mindre sideforskudte stillinger af gribeorganet.

En yderligere mulighed vil være, at vejepladen 6 benyttes  
som en slags buffer, der udmærket kan modtage i hvert fald  
25 nogle emner hurtigt efter hinanden eller endog samtidigt,  
idet en effektiv vejning så kan udføres som en "negativvej-  
ning" ved registrering af den vægtformindskelse, som en grib-  
ning og afløftning af et givet emne giver anledning til.

Hertil kommer så den omtalte mulighed for at erstatte el-  
30 ler supplere den faste vægt med en vejeindretning integreret  
i robotens gribersystem, henholdsvis ved en vægtbestemmelse  
udført på basis af en visionregistrering af emnerne eller en-  
hver anden metode til vægtbestemmelse af emnerne.

Fig. 2 viser et modificeret system, hvor en enkelt, po-  
35 lært dirigeret robotarm 26 er drejelig om en lodret akseltap  
28 placeret oven over afgangsenden af fødebåndet 2. Armen 26  
er længdeforskydelig på knækbar eller teleskopforskydelig må-  
de, således at et ydre gribeorgan 30 på denne arm kan bevæges

mellem mange forskellige positioner. Efter vejepladen 6 er der arrangeret et aflæggerområde 32, som fra gribeorganet 30 kan tilføres emner 4 i diverse positioner, således at styrecomputeren 10 vil rumme information om placering og vægt af de enkelte emner. Efter området 32 følger et område 34, som rummer et antal modtagestationer 12, og i tilknytning til områderne 32 og 34 er anbragt et par robotter 36 og 38, der kan være af samme type som robotten 28,26, dvs. have robotarme, som selektivt kan overføre emner 4 fra aflæggerområdet 32 til modtageområdet 34, f.eks. for vægtbestemt portionsopbygning i stationerne 12 efter akkumuleringsprincippet. I og med at der kan arbejdes med ganske mange emnepositioner i området 32 kan det også være relevant at benytte kombinationsvægtmetoden, dvs. hvor computeren beregner, hvilke enkeltemner fra området 32 der kan sammenføres i en og samme station 12 for opfyldelse af fastsatte betingelser for totalvægt og evt. emneantal.

I fig. 2 er vist tre robotter, men dette er naturligvis kun et eksempel for forøgelse af arbejdskapaciteten i forhold til den mulige anvendelse af kun en enkelt robot. Netop ved anvendelse af robotter vil i øvrigt områderne 32 og 34 kunne udlægges med vilkårlig eller specialoptimeret grundform og placering.

Fig. 3 illustrerer en speciel mulighed, som optræder netop ved robotanvendelse. I en modtagestation 12 er placeret en bakkeemballage 40 for modtagelse af emner i seks forskellige bakkeafsnit markeret med punkterede linier. Robotten kan med god nøjagtighed styres til nedbringning af de til bakken allokerede emner 4 i disse forskellige afsnit uden at bakken i sig selv behøver at flyttes. Dette vil være et resultat af allerede kendt robotteknologi, men det for opfindelsen særegne er, at det for styrecomputeren så også vil være muligt at "fortryde" en given allokering, hvis der efterfølgende konstateres en bedre anvendelighed af et tilbragt emne i en anden modtagestation eller en bedre anvendelighed af et nyindvejet emne i samme station. Robotten kan nemlig så dirigeres til at opsamle et udvalgt emne fra de allerede i bakken 40 aflejlrede emner for tilbageførelse af det grebne emne fra bakken med henblik på en overførsel af emnet enten direkte

til en anden modtagestation 12 eller til et aflægningsområde 32 for disponible, allerede vægtbestemte emner.

Samme princip kan udnyttes også hvor der i modtagestationerne ikke forekommer emballagebakker 40, men blot en afsætningsplade 42, som virtuelt er opdelt i forskellige modtageafsnit. Robotudrustningen kan aflevere emner 4 til ethvert af disse afsnit, men altså også udskifte emner deri, og efter en opnået ideel portionsvægt kan så alle emnerne i den pågældende station 12 bringes til samlet afgivelse, f.eks. ved at et punkteret vist skrabeorgan 44 bringes til at bestryge pladen 42 for tilskubning af alle emnerne til et afleveringsnedløb 46.

Fig. 4 illustrerer den mulighed, at de på båndet 2 tilførte emner 4 efter vært- eller artsbestemmelse f.eks. ved brug af et visionudstyr kan uddirigeres til forskellige transportbaner 48 for videre udseparering efter hensigtsmæssige kriterier, helt uden brug af særlige, direkte føringsmidler mellem afleveringsstationen 6 og føringsbanerne 48, uanset hvorledes disse føringsbaner i øvrigt udnyttes.

I denne sammenhæng vil et apparat ifølge opfindelsen være velegnet til at udføre en ren sorteringsfunktion baseret på en vægt- eller artsbestemmelse af de tilførte emner.

Det er i fig. 5 vist, at et fødebånd 2 kan aflevere emner i en stopstation 50, hvor emnerne ligefrem kan stuves sammen. Ud for denne station findes et modtageområde, hvori der er anbragt to rækker af modtageskåle 52, hver række arrangeret på et bærestativ 54 understøttet på respektive vejeceller 56. skålene har oplukkelig bund, eksempelvis udført som angivet i WO 96/12664, og nede under skålrækkerne er arrangeret fraførende transportbånd 58.

Oven over det samlede område er anbragt et robotstativ 60 med en ikke vist "XYZ"-robot. Det er fundet realistisk at lade robotten dykke ned i en række forskellige positioner i stopstationen 50 for afhentning af emner, hvorved gribepercenten vil være særdeles høj i og med at emnerne netop er og forbliver tæt sammenliggende. Robotten kan så udstyre succesivt grebne emner til enhver af skålene 52, og for hvert afgivet emne kan så den tilhørende vægtbestemmelse udføres via

vejecellerne 56. For minimering af cyklustiden kan der styres på den måde, at griberen efter hver udbringning, f.eks. som antydnet ved en punkteret linie 62, medens den derefter styres tilbage uden sidebevægelse som markeret med en stiplede linie 64.

5 Dette anlæg vil være velegnet til udvejning efter kombinationsvægtprincippet, idet styreenheden hele tiden vil søge efter et antal emnepositioner, hvis emner tilsammen giver en brugbar portionsvægt, idet de pågældende skåle så kan oplukkes samtidigt og portionsemnerne udføres på båndene 58, eventuelt blot på et enkelt bånd. Robotten har så blot til opgave hele tiden at sørge for nyudbringning af emner til de tømte og genlukkede skåle. Dette vil ikke ske med noget fast udbringningsmønster, og netop derfor vil den nævnte direkte tilbagestyring langs linien 64 resultere i, at der tages emner op fra hele bredden af stopstationen 50.

15 Ved anvendelse af flere robotter skal det blot sikres, at der pr. skålrække kun tilbringes emner successivt til en enkelt skål pr. række, da der ellers ikke kan ske en veldefineret vægt/position-registrering. Ønskes en sådan begrænsning undgået må hver af skålene udstyres med vejemidler.

20 Det skal bemærkes, at den omhandlede robotfunktion skal forstås i ret bred forstand, nemlig grundlæggende som en overløftningsfunktion med en vis selekteringsmulighed ved mindst det ene af de områder, der optræder som henholdsvis donor og recipient. Således kunne der ved udførelsen ifølge fig. 5 arbejdes med en fast afleveringsposition, nemlig hvis skålene 52 arrangeres på styret, vandret forskydelig måde for successiv tilbringning af emner til de tømte skåle eller tilsvarende modtageorganer.

## P A T E N T K R A V:

1. Fremgangsmåde ved udseparering af tilbragte emner for  
udsortering eller sammenbringning af disse efter udvalgte  
5 kriterier såsom arten eller vægten af emnerne, hvorved der  
udføres en arts- eller vægtbestemmelse af de ankomende emner  
og derefter udvirkes en selektiv sammenbringning af emnerne i  
arts- eller vægtbestemte grupper under anvendelse af en  
transportudrustning hvis tilhørende styreenhed forestår allo-  
10 keringen af de enkelte emner til respektive modtagesteder for  
emner til de forskellige grupper såvel som den tilhørende se-  
lektive styring af transportudrustningen, k e n d e t e g-  
n e t ved at der som i det mindste en del af transportud-  
rustningen benyttes en bevægeindretning af robottypen, dvs.  
15 med et gribeorgan til friløftning af emner fra en tilførsel-  
sposition og et styrbart bevægesystem for overføring af et  
grebet emne direkte og selektivt til en udvalgt afsætningspo-  
sition.

20 2. Fremgangsmåde ifølge krav 1, ved hvilken der til vægt-  
eller vægtgruppebestemmelse af emnerne anvendes en med gribe-  
organet integreret vejeindretning for vejning af de grebne og  
friløftede emner.

25 3. Fremgangsmåde ifølge krav 1, ved hvilken der til vægt-  
bestemmelse af emnerne udføres en "negativvejning" af disse,  
nemlig ved at emnerne tilføres til en statisk vægt i nævnte  
tilførselsposition og at emnevægten registreres som en vægt-  
formindskelse, som finder sted ved fjernelsen af den enkelte  
30 emner.

4. Fremgangsmåde ifølge krav 1, ved hvilken der til  
arts-, vægt- og/eller positionsbestemmelse af emnerne benyt-  
tes en visionsudrustning.

35

5. Fremgangsmåde ifølge krav 1, ved hvilken robotudrust-  
ningen påvirkes til periodisk eller efter behov alternativt  
at gennemføre en rensningsprocedure i dens virkeområde, nem-

lig ved gribning af en tilførselsslange for vand eller et andet rensemiddel for påstråling deraf på relevante installationer i området.

5        6. Apparat til udøvelse af fremgangsmåden ifølge krav 1, kendetegnet ved at dets transportudrustning i det mindste delvis udgøres af en bevægeindretning af den angivne robottype.

10       7. Apparat ifølge krav 6, ved hvilket der i robottens emnegribesystem er indskudt en vejeindretning til vægtbestemmelse af de grebne og friløftede emner.

15       8. Apparat ifølge krav 6, ved hvilket der i en tilførselsposition for emnerne forekommer en statisk vægt til successiv modtagelse af et eller flere emner til akkumulerende indvejning af emnerne, således at en operativ vægtbestemmelse af et grebet og friløftet emner kan udføres ved bestemmelse af den derved fjernede vægt.

20

9. Apparat ifølge krav 6, ved hvilket der i et tilgangs-område for emnerne er anbragt et visionsudstyr til arts-, vægt- og/eller positionsbestemmelse af emnerne.

25       10. Apparat ifølge krav 6, ved hvilket der i forbindelse med et tilførselsområde for emner forekommer en stopstation for opbygning af en emnesammenstuvning, og at robotudrustningen er indrettet til at opsamle emner derfra ved griberaktivering i skiftende positioner.

30



**S A M M E N D R A G:**

I udportioneringsanlæg er det aktuelt at arts- eller vægtbestemme successivt tilførte emner og derefter bevæge emnerne til selektiv aflevering i udvalgte modtagestationer. Ved opfindelsen gøres brug af robotteknik til fremkaldelse af de relevante flytninger af emnerne, hvilket byder på en række fordelagtige muligheder.

2/prb

### A grader apparatus

The present invention concerns a weighing and portioning technique based on the so-called grader technique, where a number of items which are to be portioned out, namely natural  
5 foodstuff items with varying weight, are subjected to a weighing-in and are thereafter selectively fed together in a computer-controlled manner to receiving stations for the building-up of weight-determined portions in these stations. In accordance with the known practice, this is effected by a  
10 weighing-in on dynamic scales and a subsequent transport along a sorting-out track with control means which can be activated in a selective manner for the delivery of the items to the respective receiver stations along this track.

With the invention it has been realised that use can be  
15 made, with very attractive consequences, of a radically changed technique for carrying out both the relevant task and various related operations, namely by not only effecting the delivery, but preferably also the weighing-in while making use of the gradually highly- and commercially-developed robot  
20 technique.

Especially with the use of vision equipment, it is an easy task for a robot arm to grip a conveyed item in a delivery area, e.g. with a suction cup, and feed the item to any receiving station within the operational range of the robot  
25 arm. This can be effected immediately if the item has already been weighed and its position determined with regard to the receiving station, and thus these stations do not have to be physically disposed in any certain pattern such as along a conveyor belt, regardless of whether a certain row disposition can be practical out of regard for the guiding-out and  
30 feeding away of the formed portions.

However, it is an important aspect of the invention that the robot arm in itself can be arranged not only to grip the

items, but also to determine the weight of a supplied item already during an initial lifting of the item from its under layer. This can be effected in a direct manner by mounting the gripping tool on the robot arm in connection with a weighing cell and preferably also an accelerometer, so that a weighing can be effected during an uneven movement, preferably by an initial vertical lifting, so that the weight determination and allocation of the item can be carried out when the item is lifted to a height from which there is initiated a bringing-out of the item in a direction towards the selected receiving station, including a swinging-out for the execution of a movement along one or more e.g. circular rows of receiving stations. The weight determination can also be effected in a less direct manner, e.g. by use of a vision system which, in connection with the lifting of the item, is now also given access for a detection of the underside of the item, whereby the weight can be determined with an accuracy which can be sufficient in many connections. An indirect weight determination can also be effected by the robot arm being influenced with a carefully controlled lifting moment, which will be opposed by the inertia of the item, whereby with a moment analysis of the lifting sequence an expression for the item weight can be calculated.

With the use of vision equipment for place determination of arriving items in connection with the robot-based weight determination of the gripped items, there arises a distinct changing of the conditions which have hitherto been valid for the function of the grading machines. This function has hitherto been conditional on the arriving items being fed individually to the dynamic weighing station, and thereafter conveyed individually, i.e. with suitable distance between them, along the sorting-out track, which hereafter will not apply. The vision equipment can monitor a relatively long and broad supply area at which the items can arrive both at the side of

each other and without any critical separation, neither in breadth nor lengthways direction, in that the robot arm can nevertheless drop down with great precision on any selected item. It will be a further possibility that the vision equipment can monitor up to several candidate items in seeking for an item of a certain precise weight, e.g. for the conclusion of a building-up of a portion to a fixed weight. If the vision equipment in itself is not able to effect a weight determination with the necessary accuracy, it will still, however, be able to weigh the items in a "weight-class-determined" manner, and thus hereby disclose e.g. 2-4 items which, with good probability, can be so close to the sought-after weight that one of the items will in any case be able to be used for the purpose. There can thus be effected a more accurate weight determination by the operative robot carrying out a control-weighing of these selected items, and hereby either select the best candidate or omit to use any of them.

To this can be added that by use of the vision equipment, there can also be effected a type determination of items which are supplied in mixed type formation, e.g. in the form of different pieces of parted chickens. In certain productions this will be a quite important criterion for the allocation of the items.

It must be emphasised, however, that it will not be any precondition that use be made of vision equipment, in that it has been found possible to let a robot gripping element fetch items from an area with closely-grouped items. The gripping element can possibly be arranged with a sensor for registration of a failure to grip any item, after which it can be immediately moved slightly for a new attempt.

In the handling of items such as whole fish or chicken legs ("drumsticks"), which are desired to be received at each of the receiving stations in oppositely-directed orientations so that they can be placed together in close formation, or

that they can be built up in a receiving box in portions in several layers for achieving a more-or-less horizontal upper layer in the box filling, the control unit will easily be able to be instructed whether the robot arm's gripping tool is to be influenced, if necessary, to turn the gripped item through such an angle that will be suitable for ensuring that the item, upon delivery to the receiving station, will have an orientation which accommodates the relevant requirement on the basis of the information which already exists in the control computer.

Furthermore, with the invention it will be a possibility that "the system", i.e. the controlling of the robot arm, is programmed so that from time to time, and e.g. especially after each working day, the robot arm's gripping tool is controlled for gripping a cleaning nozzle or hose, by means of which the apparatus can thereafter clean itself and all the receiving stations. Finally, the gripping tool itself can be cleaned by co-operation with a stationary cleaning nozzle.

There is hitherto considered a weight-determined portioning-out, but the technique will have further possibilities such as a pure sorting-out of items in accordance with more or less any criterion, which shall not necessarily involve a weight criterion, e.g. in accordance with type, colour, shape, degree of possible deformation etc.

The technique can also be used for the distribution of items out to a group of receiving stations, in which the received items are weighed separately with the view to feeding them together in weight-determined portions on the basis of the so-called combination-weight principle.

In the laying-out of items on a packing element, such as slices of salmon on a cardboard plate, or the laying-out of items in assortment boxes, it will be a possibility that there has been laid an item which proves to be able to be replaced by a more suitable item, and here there will be the

special possibility both that the items can be placed in special patterns, e.g. by scale layout or at the side of one another, and that the robot can be directed by the control unit to remove the "wrong" item from the under layer in favour of the laying-out of an even better item.

It is mentioned that in the supply area to the robot there can appear a relatively large number of items which can be gripped selectively, possibly even by more than a single robot. It can hereby arise that a deficit of items of one or more different qualities can be registered, e.g. in type or size, which are awaited for the furthering of a quick portioning-out. In this connection, it is a possibility that work can be effected with a supply area coupled up front, possibly even of increased size, where one or more robots work in a corresponding manner for the selective transfer of relevant items to the operative supply area.

If the operative robot arm grips an item which after weight determination is not suitable for placing in any of the receiving stations, it can deliver the item either to a re-circulation station or merely back to the supply area, or to a special parking area for items already weight determined, which are thus ready for selective collection at the first given opportunity during the further sequence.

Such a "parking area" can also be used operatively by one or more of the robots being used to receive and to carry out the weight determination of the supplied items, and thereafter deliver the items in a parking area during registration of the respective positions and weights. Hereafter, the only task to be carried out by the operation robot will to distribute the items out to the receiving stations, i.e. it can be without weighing means and without vision equipment, and it can work at increased speed in that the weighing function is omitted. In the parking area, the items can be placed closely at the sides of one another, i.e. operations can be

effected with a quite large number of candidates for portioning-out.

When work is to be carried out with the desirable, relatively fast operation frequencies, it can be quite difficult to arrange weighing equipment in connection with a robot arm. It has already been mentioned that the weighing can well be effected by an intermediate delivery of the items to a static weighing device, but this will inevitably result in an increase in the cycle time, since at each weighing there will arise both an in-swinging period and a weighing period, and since none of these can be integrated with an operative movement of items, both of these periods, regardless of whether they can be of short duration, will have a delaying effect on a quick handling of the items. In light of this, it is a special feature of the invention that it can work with "negative weighing", namely in that newly arrived items can be fed successively to a static weighing device or buffer scales which register the weight of that or those items which are placed on the scales, in that the weight determination of an item, which is then gripped and removed by the robot arm can hereby be registered by the associated reduction in the weight on the scales. The said swinging-in and weighing sequences can hereby be concluded already before the relevant item is gripped and removed, and even though a renewed swinging-in and weighing period must subsequently be accepted for determination of the weight of the removed item, this can thus be effected during the actual initial movement of the gripped item, and consequently integrated anyway with this movement without delaying the movement.

In the foregoing it is intimated that the "robot arm" moves in a pivoting movement, regardless of whether the robot otherwise or also moves in diverse horizontal directions, and here it must merely be emphasised that the invention will not be limited in a corresponding manner, the reason being that

the robot arm, with its related gripping element, can be displaced just as well as a fixed arm on a robot structure, which as an integrated whole moves in a controlled, co-ordinate-related manner in a length/breadth-controlled operating system.

In the following, the invention will be described in more detail precisely on the basis of such a co-ordinate-related system, without this excluding a pivoting system, and moreover with reference to the drawing, in which

fig. 1 is a schematic perspective view of a sorting-out or portioning apparatus according to the invention,

fig. 2 is a schematic plan view of a modified plant according to the invention,

fig. 3 is a perspective view of a receiving station therein,

fig. 4 is a plan view of a second modified plant, and

fig. 5 is a schematic perspective view of a third modified plant.

In fig. 1 there is shown a supply conveyor 2 which conveys relevant items 4 to a weighing plate 6 belonging to a weighing station, which is represented by an underlying weighing cell 8, and which is connected to a registration and control computer 10. The conveyor belt 2 continues thereafter to a double row of receiving containers or receiving stations 12, which are shown arranged in direct extension of the conveyor 2, but which could just as well assume any other direction, e.g. at right-angles to the conveyor.

Over the weighing plate there is arranged a co-ordinate-controlled guiding system 14 for an item gripping unit 16 consisting of a base part 18, which by suitable driving means is transversely displaceable in the manner of a carriage on a lengthways displaceable crossbar 20 in the structure 14, and which also has a downwards-extending arm 22 with a lower



gripping element 24 which can be moved up and down and be activated for the gripping/releasing of items 4.

The gripping element 24 could equally well be placed on a pivot arm in a diametrically-directed guide system, whereby  
5 the row of receiving stations 12 could naturally extend with a distinct curve.

When an item 4 has been delivered to the weighing plate 6, it can quickly afterwards be gripped by the gripping element 24 and thereafter carried forward for depositing in any  
10 of the receiving stations 12, based on the allocation decisions which in accordance with conventional grader technique are made by the control computer 10.

Some of the feeding problems which arise with the known grader technique will hereby already have been overcome,  
15 namely especially with regard to adhering items or items which roll easily, which can be difficult to distribute when this shall take place by sideways guiding-out from a feeding conveyor. The weighing plate 6 or a preceding section of the feeding conveyor 2 can possibly be provided with forwardly-  
20 tapering, upright V-shaped rib structure 22 which will determine a well-defined delivery position for the items 4, so that the items can be gripped and carried forward by the gripping element 24 with good security. Upon delivery of the items to the receiving stations 12, there will not arise any  
25 substantial degree of insecurity, in that all that is involved here is a more-or-less precise releasing of the gripped items 4 from the overlying gripping element 24.

In connection with the invention, however, it will be an advantageous possibility that use can be made of a detector  
30 system such as a vision camera, which can detect any non-central positioning of items 4 on the conveyor belt 2, and thus also determine whether relevant items shall be gripped in more-or-less sideways-displaced positions by the gripping element.

A further possibility will be that of using the weighing plate 6 as a kind of buffer, which in any case can well receive items in quick succession or even at the same time, in that an effective weighing can then be carried out as a "negative weighing" by registration of the reduction in weight which arises with a gripping and lifting of a given item.

To this can be added the mentioned possibility of replacing or supplementing the fixed weighing device with a weighing arrangement integrated with the robot's gripping system, or by a weight-determination carried out on the basis of visual registration of the items, or by any other method for determining the weight of the items.

Fig. 2 shows a modified system, where a single diametrically-directed robot arm 26 is pivotal around a vertical journal 28 placed over the discharge end of the feeding conveyor 2. The arm 26 can be displaced longitudinally in a foldable or telescopically displaceable manner, so that an outer gripping element 30 on the arm can be moved between many different positions. After the weighing plate 6 there is arranged a distribution area 32 which can be supplied with items 4 in different positions from the gripping element 30, so that the control computer 10 will contain information concerning the positioning and weight of the individual items. After the area 32 there follows an area 34 which houses a number of receiving stations 12, and in association with the areas 32 and 34 there are placed a pair of robots 36, 38 which can be of the same type as the robot 28, 26, i.e. with robot arms which can selectively transfer items 4 from the distribution area 32 to the receiving area 34, e.g. for the building-up of weight-determined portions in the stations 12 in accordance with the accumulation principle. In that work can be effected with a great many item positions in the area 32, it can also be relevant to use the combination-weight

method, i.e. where the computer determines which of the individual items from the area 32 can be brought together in one and the same station 12 for fulfilling predetermined conditions concerning total weight and possibly the number of items.

In fig. 2 there are shown three robots, but this is naturally only an example for the increase of the working capacity in relation to the possible use of only one single robot. Precisely with the use of robots, the areas 32 and 34 will otherwise be able to be laid out with random or specially optimised basic form and positioning.

Fig. 3 illustrates a special possibility which arises precisely with the use of robots. In a receiving station 12 there is placed a carton packing 40 for the receipt of items in six different sections of the carton, which are shown with stippled lines. The robot can be controlled with good precision for placing the items 4, which have already been allocated to the carton, down in these different sections without the carton itself having to be moved. This will be a result of already-known robot technology, but it is a special characteristic of the invention that it will also be possible for the control computer to "regret" a given allocation if it is subsequently ascertained that an item delivered to a receiving station is more suitable for use in another receiving station, or a better use of a newly-weighed item in the same station. The robot can thus be instructed to collect a selected item from the items already placed in the carton packing 40 for transferring the gripped item back from the carton, with the view either of transferring the item directly to another receiving station 12 or to a distribution area 32 for available, already weight-determined items.

The same principle can also be used where carton packing 40 does not appear in the receiving stations, but simply a depositing plate 42 which is virtually divided into different

receiving sections. The robot equipment can deliver items 4 to any of these sections, but can thus also replace items therein, and after an ideal portion weight has been achieved, all of the items in the relevant station 12 can then be delivered collectively, e.g. by a scraper element 44 shown with stippled lines being made to sweep the plate 42 for the shoving of all of the items to a delivery chute 46.

Fig. 4 illustrates the possibility that after weight and type determination, e.g. by use of vision equipment, the items 4 fed on the conveyor 2 can be directed out to different conveyor tracks 48 for further sorting-out in accordance with suitable criteria, completely without the use of special, direct guiding means between the delivery station 6 and the feeding tracks 48, regardless of how these guiding tracks are used in other respects.

In this connection, an apparatus according to the invention will be suitable for carrying out a pure sorting function based on weight or type determination of the supplied items.

In fig. 5 it is shown that a conveyor 2 can deliver items to a stop station 50 where the items can simply be crammed together. Opposite this station there is a receiving area in which two rows of receiving dishes 52 are provided, each row being arranged on a frame 54 supported on respective weighing cells 56. The dishes have bottoms which can be opened, e.g. configured as disclosed in WO 98/12664, and under the rows of dishes there is arranged a conveyor 58 leading away from the station

Over the overall area there is provided a robot frame 60 with a not-shown "XYZ"-robot. It has been found realistic to let the robot dip down in a number of different positions in the stop station 50 for the collection of items, whereby the gripping percentage will be particularly high in that the items are and remain lying closely together. The robot can

thus transfer successively gripped items to any of the dishes 52, and for each item transferred the associated weight determination can thus be effected via the weighing cells 56. In order to minimise the cycle time, the apparatus can be controlled in such a manner that after each transfer, e.g. as indicated by a stippled line 62, the gripping element will thereafter be guided back without sideways movement as marked with a stippled line 64.

This plant will be suitable for weighing-out following the combination-weight principle, in that the control unit will constantly seek a number of item positions with items which together form a usable portion weight, in that at the same time the relevant dish can be opened and the portioned items deposited on the conveyors 58, or possibly only on a single conveyor. The robot thus merely has the task of constantly effecting new transfers of items to the empty and re-closed dishes. This will not be effected with any fixed transfer pattern, and precisely for this reason the said direct return movement along the line 64 will have the result that items are taken up from the whole breadth of the stop station 50.

When use is made of several robots, it must merely be ensured for each row of dishes that items are transferred successively only to a single dish per row, since otherwise a well-defined weight/position registration can not be effected. If it is desired to avoid such a limitation, each of the dishes must be equipped with weighing means.

It must be noted that the robot function disclosed shall be understood in quite a broad sense, namely fundamentally as a lifting-over function with a certain possibility of selectivity at least at the one of the areas which serve as donor and recipient respectively. With the embodiment according to fig. 5, work could thus be carried out with a fixed delivery position, namely if the dishes 52 are arranged in a con-

trolled, horizontally-displaceable manner for the successive transfer of items to the empty dishes or corresponding receiving elements.

## C L A I M S

1. Method for the separating-out of supplied items for the sorting-out or batching of these items in accordance with  
5 selected criteria such as type or weight of the items, whereby a type- or weight-determination of the arriving items is carried out, and after which there is effected a selective batching of the items in type- or weight-determined groups while using transport equipment having an associated control  
10 unit which arranges the allocation of the individual items to respective receiving stations for items for the different groups, and for the related selective control of the transport equipment, c h a r a c t e r i s e d in that a transfer arrangement of the robot type is used as at least a part of  
15 the transport equipment, i.e. with a gripping element for the lifting-free of items from a supply position and a controllable movement system for the transfer of a gripped item directly and selectively to a selected depositing position.

2. Method according to claim 1, by which for the  
20 weight- or weight-group determination of the items, use is made of a weighing arrangement which is integrated with the gripping element for the weighing of the gripped and lifted-free items.

3. Method according to claim 1, by which a "negative  
25 weighing" of the items is carried out for the weight-determination of the items, namely that the items are supplied to a static weighing device in said supply position and that the item weight is registered as a weight reduction, which takes place by the removal of the individual item.

30 4. Method according to claim 1, by which use is made of vision equipment for the type-, weight- and/or position-determination of the items.

5. Method according to claim 1, by which the robot equipment is influenced to carry out a periodic, or alterna-

tively as required, cleaning procedure in its area of operation, namely by the gripping of a supply hose for water or other cleaning agent for the spraying of this on relevant installations in the area.

5           6. Apparatus for the execution of the method according to claim 1, characterised in that its transport equipment at least consists partly of a transfer arrangement of the disclosed robot type.

10           7. Apparatus according to claim 6, whereby in the robot's gripping system there is inserted a weighing device for the weight-determination of the gripped and lifted-free items.

15           8. Apparatus according to claim 6, whereby in the supply position for the items there is a static weighing device for the successive receipt of one or more items for accumulated weighing-in of the items, so that an operative weight-determination of a gripped and lifted-free item can be effected by determination of the weight removed hereby.

20           9. Apparatus according to claim 6, whereby in connection with a supply area for the items there appears a stop station for the building-up of items in a closely-packed manner, and that from here the robot equipment is arranged to pick up items by gripping activation in changing positions.



## Abstract

In portioning-out plants, it is current practice for the successively supplied items to be type- or weight-determined and thereafter transferred for selective depositing in selected receiving stations. With the invention, use is made of robot technique for effecting the relevant transfer of the items, which offers a number of advantageous possibilities.

1/2

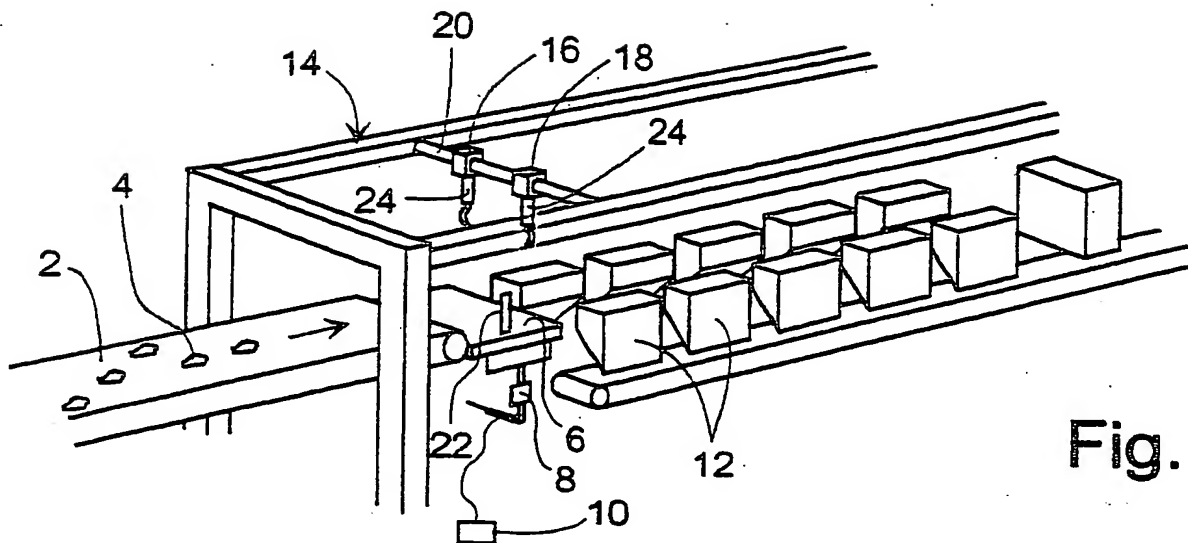


Fig. 1

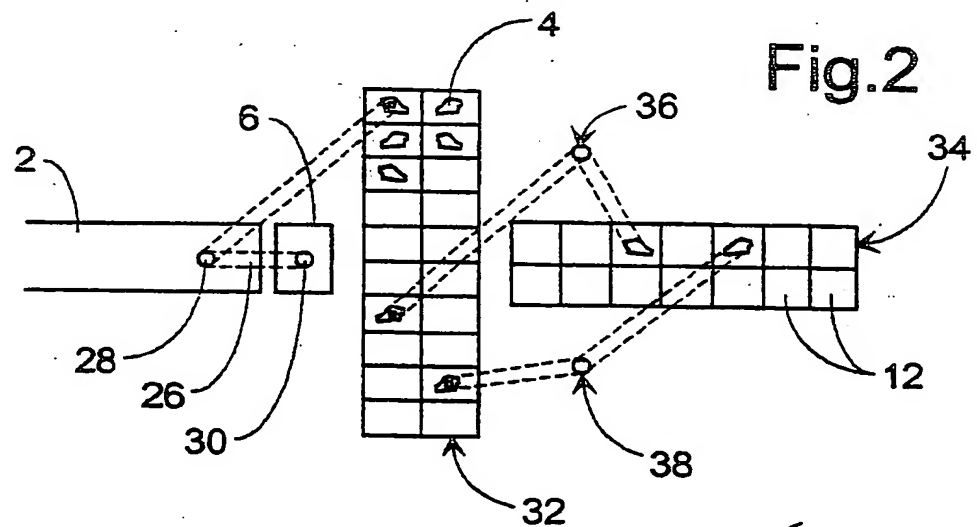


Fig. 2

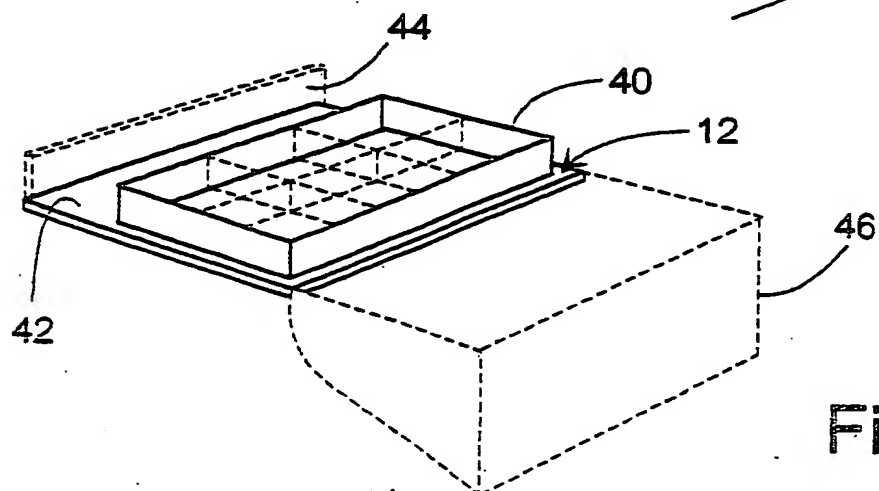


Fig. 3

2/2

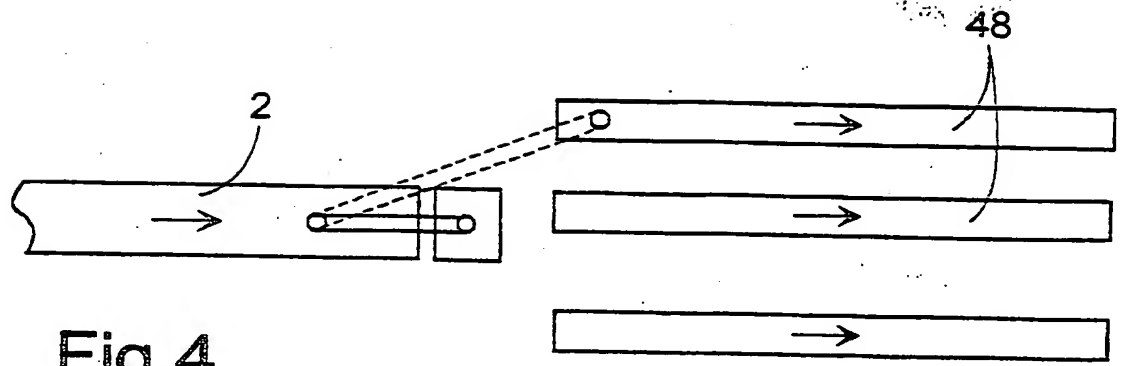


Fig. 4

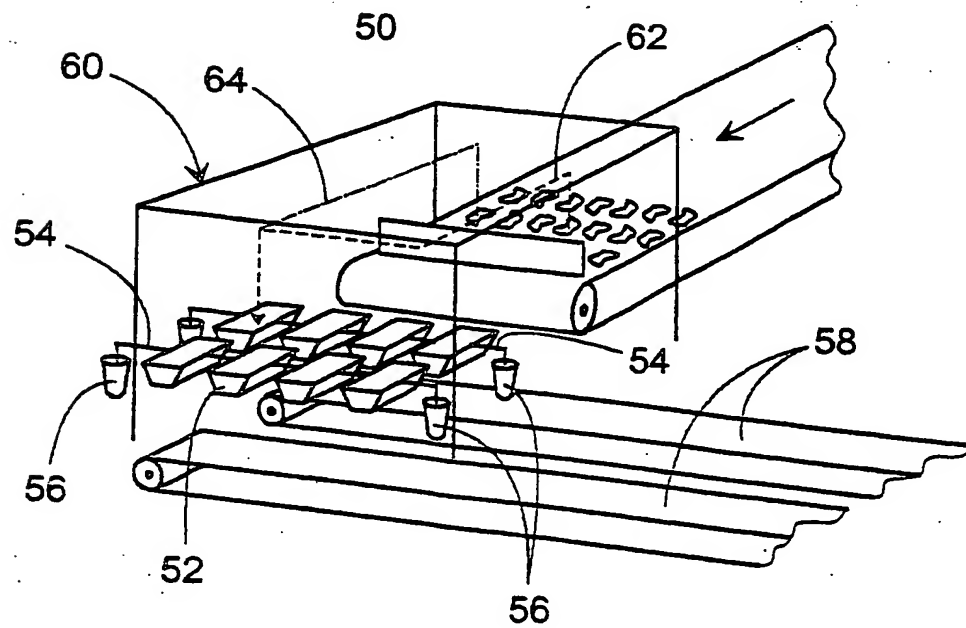


Fig. 5

## C L A I M S

1. Method for the separating-out of supplied items for the sorting-out or batching of these items in accordance with selected criteria such as type or weight of the items, whereby a type- or weight-determination of the arriving items is carried out, and after which there is effected a selective batching of the items in type- or weight-determined groups while using transport equipment having an associated control unit which arranges the allocation of the individual items to respective receiving stations for items for the different groups, and for the related selective control of the transport equipment, characterised in that a transfer arrangement of the robot type is used as at least a part of the transport equipment, i.e. with a gripping element for the lifting-free of items from a supply position and a controllable movement system for the transfer of a gripped item directly and selectively to a selected depositing position.

2. Method according to claim 1, by which for the weight- or weight-group determination of the items, use is made of a weighing arrangement which is integrated with the gripping element for the weighing of the gripped and lifted-free items.

3. Method according to claim 1, by which a "negative weighing" of the items is carried out for the weight-determination of the items, namely that the items are supplied to a static weighing device in said supply position and that the item weight is registered as a weight reduction, which takes place by the removal of the individual item.

4. Method according to claim 1, by which use is made of vision equipment for the type-, weight- and/or position-determination of the items.

5. Method according to claim 1, by which the robot equipment is influenced to carry out a periodic, or alterna-

tively as required, cleaning procedure in its area of operation, namely by the gripping of a supply hose for water or other cleaning agent for the spraying of this on relevant installations in the area.

5           6. Apparatus for the execution of the method according to claim 1, c h a r a c t e r i s e d in that its transport equipment at least consists partly of a transfer arrangement of the disclosed robot type.

10           7. Apparatus according to claim 6, whereby in the robot's gripping system there is inserted a weighing device for the weight-determination of the gripped and lifted-free items.

15           8. Apparatus according to claim 6, whereby in the supply position for the items there is a static weighing device for the successive receipt of one or more items for accumulated weighing-in of the items, so that an operative weight-determination of a gripped and lifted-free item can be effected by determination of the weight removed hereby.

20           9. Apparatus according to claim 6, whereby in connection with a supply area for the items there appears a stop station for the building-up of items in a closely-packed manner, and that from here the robot equipment is arranged to pick up items by gripping activation in changing positions.

## PATENT COOPERATION TREATY

## PCT

## INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference <b>17.078</b>	<b>FOR FURTHER ACTION</b> see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. <b>PCT/DK 00/ 00501</b>	International filing date (day/month/year) <b>11/09/2000</b>	(Earliest) Priority Date (day/month/year) <b>10/09/1999</b>
Applicant <b>SCANVAEGT INTERNATIONAL A/S et al.</b>		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 3 sheets.



It is also accompanied by a copy of each prior art document cited in this report.

## 1. Basis of the report

- a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.



the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

- b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing :



contained in the international application in written form.



filed together with the international application in computer readable form.



furnished subsequently to this Authority in written form.



furnished subsequently to this Authority in computer readable form.



the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.



the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. ☐ **Certain claims were found unsearchable** (See Box I).

3. ☐ **Unity of invention is lacking** (see Box II).

4. With regard to the **title**,

the text is approved as submitted by the applicant.



the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

the text is approved as submitted by the applicant.



the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is Figure No.

as suggested by the applicant.



because the applicant failed to suggest a figure.



because this figure better characterizes the invention.

1



None of the figures.

A. CLASSIFICATION OF SUBJECT MATTER  
 IPC 7 G01G13/00 B01J 16

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 G01G B07C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 95 35238 A (SCANVAEGT AS ) 28 December 1995 (1995-12-28) page 8, line 18 - line 31; figure 4 ---	1,6
X	GB 2 167 211 A (BRITISH CAST IRON RES ASS) 21 May 1986 (1986-05-21) page 3, line 20 - line 115 ---	1,4,6
X	US 5 501 571 A (W VAN DURRETT ET AL) 26 March 1996 (1996-03-26) column 4, line 30 - line 64; figure 1A ---	1,4,6
X	EP 0 706 838 A (SPELLENC SA ) 17 April 1996 (1996-04-17) abstract; figure 2 ---	1,4,6
	--- -/--	

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

\* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

14 December 2000

Date of mailing of the international search report

23.03.01

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2  
 NL - 2280 HV Rijswijk  
 Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,  
 Fax: (+31-70) 340-3016

Authorized officer

Lars Jakobsson

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 98 19799 A (NAT RECOVERY TECH INC) 14 May 1998 (1998-05-14) page 14, line 23 -page 15, line 5; figure 5	1,4,6
X	--- PATENT ABSTRACTS OF JAPAN vol. 18, no. 243 (M-1602), 10 May 1994 (1994-05-10) & JP 60 031667 A (HITACHI LTD), 8 February 1985 (1985-02-08) abstract -----	1,2,6



# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/DK 00/00501

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
WO 9535238	A	28-12-1995	AU 2733795 A DE 69507804 D DE 69507804 T DK 764113 T EP 0764113 A NO 965408 A	15-01-1996 25-03-1999 23-09-1999 20-09-1999 26-03-1997 06-02-1997
GB 2167211	A	21-05-1986	NONE	
US 5501571	A	26-03-1996	NONE	
EP 0706838	A	17-04-1996	FR 2725640 A AT 195272 T DE 69518293 D ES 2151587 T	19-04-1996 15-08-2000 14-09-2000 01-01-2001
WO 9819799	A	14-05-1998	AU 5155798 A US 6124560 A	29-05-1998 26-09-2000
JP 60031667	A	18-02-1985	NONE	